Watershed: **Sacramento River – Dry Creek**

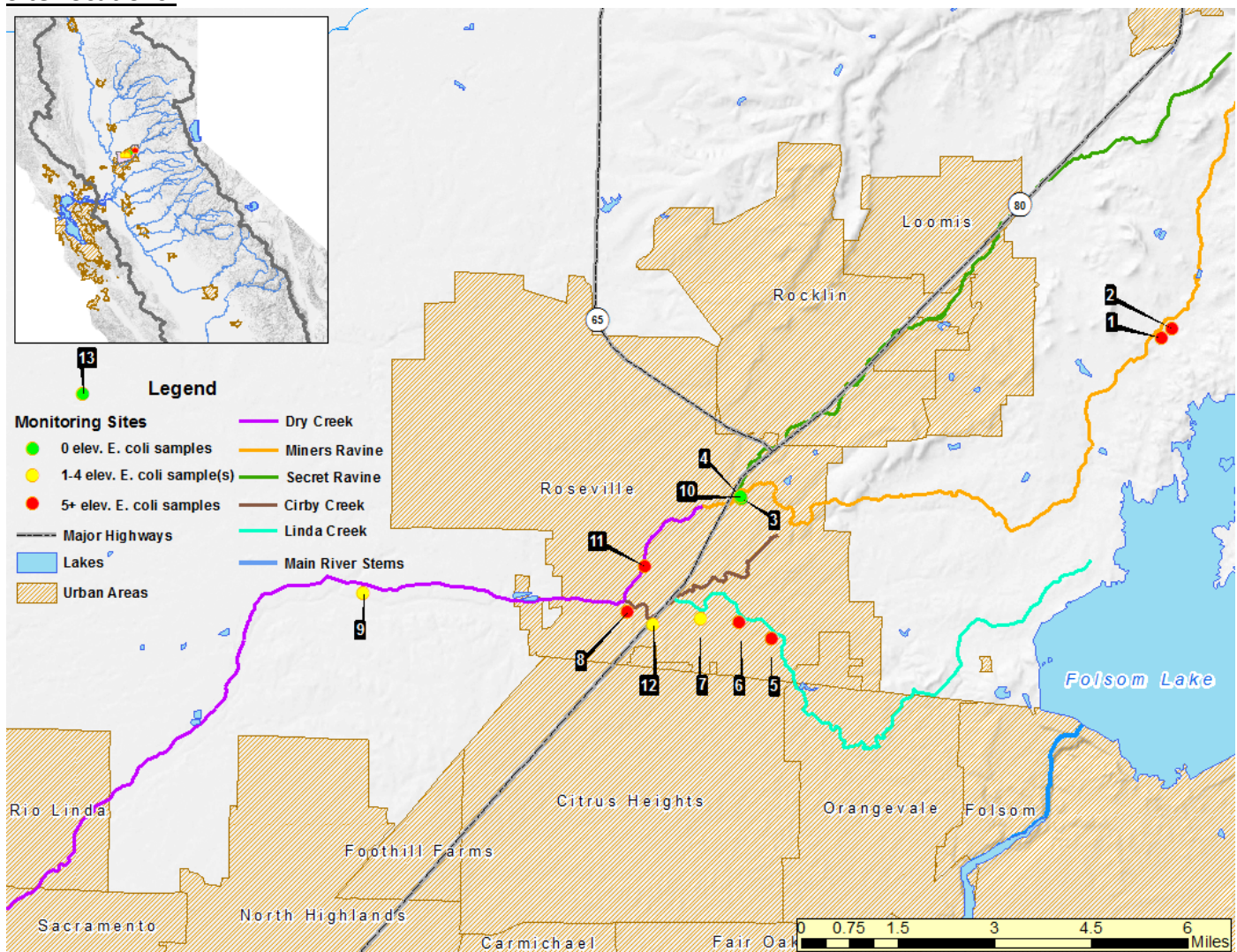**Years Sampled:** **2008-2014**

Study Objectives:
1. Is there any evidence that beneficial uses are being impacted, and if so, what are potential contributors?
2. Are there any noticeable regional, seasonal or trends observed in the water quality data?
3. What are pathogen concentrations at selected monitoring sites?

KEY STATISTICS

Number of sites sampled	**13**
Sampled by	**Water Board Staff (Sac)**
Number of sites sampled for pathogens	**9**
Number of total samples	**404**
Sampling Frequency	**2x/mo. (May-Sept.)**
Assessment Threshold	**320 MPN/100 mL**

Message: **Nine sites have had one or more samples with elevated *E.coli* and five sites have tested positive for pathogens. Four sites never exceeded the assessment threshold.**

Site Locations:

Legend

Monitoring Sites
- ● 0 elev. E. coli samples
- ● 1-4 elev. E. coli sample(s)
- ● 5+ elev. E. coli samples
- --- Major Highways
- ▨ Lakes
- ▨ Urban Areas

- — Dry Creek
- — Miners Ravine
- — Secret Ravine
- — Cirby Creek
- — Linda Creek
- — Main River Stems

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Summary of Results:

Table 1: Field Measurements

Station Code	Map #	Station Name	Oxygen, Dissolved (mg/L)		pH		SpConductivity (uS/cm)		Temperatiure (°C)		Turbidity (NTU)	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
514PLA905	1	Miners Ravine at Dick Cook Rd	7.23	9.78	7.17	8.09	70.2	290.0	15.19	25.70	1.58	49.70
514PLA906	2	Miners Ravine at Glenbrook Estates	7.54	9.09	6.89	7.60	54.0	236.0	18.18	23.58	1.62	4.72
519PLA910	3	Secret Ravine upstream of Miners Ravine confluence	6.74	9.88	7.23	7.72	83.0	223.0	16.68	22.38	2.14	31.70
519PLA912	4	Miners Ravine upstream of Secret Ravine confluence	6.74	9.92	7.33	7.78	94.0	250.0	18.26	22.73	1.52	7.20
519PLA920	5	Linda Creek at Champion Oaks	3.86	11.66	7.12	8.10	82.0	477.0	16.13	23.34	1.11	6.84
519PLA921	6	Linda Creek at Condor Court	4.04	14.10	7.12	8.91	104.1	472.0	15.20	24.88	1.18	9.79
519PLA922	7	Linda Creek at Oak Ridge	7.82	11.84	7.31	8.43	192.0	481.0	16.40	24.67	1.88	6.97
531PLA900	8	Dry Creek/Cirby Creek Confluence	6.04	12.51	6.91	9.72	28.0	305.0	15.59	25.98	2.13	52.00
531PLA901	9	Dry Creek at Walerga Bridge	7.20	12.16	7.46	8.06	111.0	343.0	17.05	26.26	1.89	10.80
531PLA902	10	Miners Ravine/Secret Ravine Confluence	6.37	11.73	7.14	8.15	93.0	273.0	14.37	23.00	1.11	26.10
531PLA903	11	Dry Creek at Royer Park	6.41	12.03	7.21	7.85	94.0	290.0	15.21	24.44	2.45	9.55
531PLA904	12	Cirby Creek at Elisa Way near I-80	2.71	13.32	7.13	8.28	228.0	454.0	15.63	25.65	1.48	7.78
531SAC900	13	Dry Creek at Hayer Dam	NR	NR	7.73	7.74	257.6	299.5	22.50	25.00	NR	NR
NR: Not Recorded												

Table 2: *E. coli* and Pathogen Results

Map #	*E. coli* (MPN/100mL)					*Cryptosporidium* (cysts/L)			*Giardia* (oocysts/L)			*Salmonella* (MPN/100mL)			*E.Coli O157:H7* (Presence/Absence)		
	Mean	Min	Max	Count	>320	Max Result	Count	(+)	Max Result	Count	(+)	Max Result	Count	(+)	Result	Count	(+)
1	422.3	90.6	1986.3	21	9	NA	0	0	NA	0	0	Not Detected	1	0	Not Detected	1	0
2	279.6	44.8	727.0	13	5	NA	0	0	NA	0	0	NA	0	0	NA	0	0
3	105.9	58.3	157.6	11	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
4	113.4	31.5	228.2	12	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
5	460.3	146.7	920.8	20	14	0.4	1	1	0.2	1	1	Not Detected	1	0	Not Detected	1	0
6	268.5	32.3	866.4	27	8	0.1	6	3	0.1	6	1	0.1	6	3	Not Detected	6	0
7	353.0	104.6	1413.6	14	4	NA	0	0	NA	0	0	Not Detected	1	0	Not Detected	1	0
8	340.6	28.7	2419.6	56	11	0.1	12	9	4.5	12	9	5.1	12	9	Present	12	1
9	156.0	11.6	345.0	25	1	0.1	2	1	4.9	2	1	2.2	1	1	Not Detected	1	0
10	122.7	18.7	307.6	30	0	0.1	8	3	6.3	8	3	0.2	7	5	Not Detected	7	0
11	211.9	85.5	461.6	23	5	Not Detected	1	0	Not Detected	1	0	Not Detected	2	0	Not Detected	2	0
12	265.6	53.8	1203.3	21	4	Not Detected	1	0	Not Detected	1	0	Not Detected	2	0	Not Detected	2	0
13	73.8	43.2	117.8	3	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0

E.coli- Highlighted Cells: Exceeds EPA Guidline of 320 MPN/100ml   Pathogens- (+): positive result, Highlighted Cells: positive results, NA: Not Applicable

Graph 1: *E.coli* Results

Linda Creek → Cirby Creek

Miners Ravine →

Secret Ravine/Miners Ravine confluence

E. coli (MPN/100mL)

Station Code
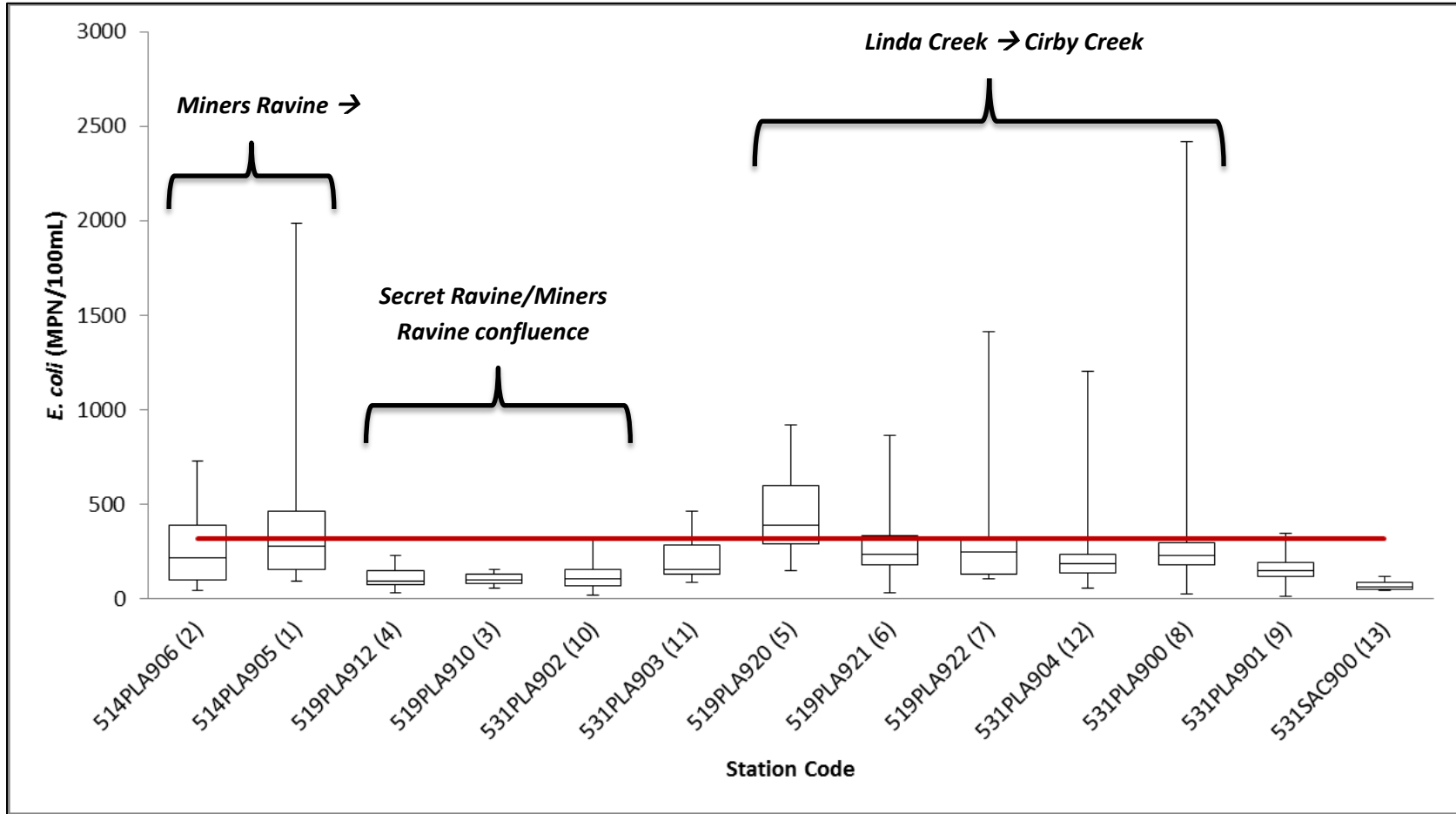
2,1 = progressive DS flow along upper Miners Ravine; 4,3,10 = 4 (Secret Ravine) and 3 (Miners Ravine) flow to 10 (Miners Ravine confluence);
5,6,7,12,8 = progressive DS flow from Linda Creek to Cirby Creek

WHAT IS THE MEASURE SHOWING?

Dry Creek is located within the Sacramento River watershed. Existing between the cities of Sacramento and Roseville, this watershed is one of the quickest urbanizing areas in California, exhibiting periodic flooding due to high impervious cover. In Roseville, Dry Creek forms from the combined tributaries of Miners Ravine, Secret Ravine, Cirby Creek, and Linda Creek. As the stream flows southwest, it crosses through Rio Linda and merges with Natomas East Main Drainage Canal where it empties into the Sacramento River. Field measurements for each site are shown in Table 1.

Results show that nine sites exhibited elevated levels of *E. coli* in the Dry Creek sub watershed on one or more occasions (shown in Table 2). There were 61 samples with elevated levels out of 276 samples, or 22.1%. The highest concentration (>2419.6 MPN/100mL) occurred at the Cry Creek/Cirby Creek confluence (8). This confluence, Linda Creek at Champion Oaks (5), Linda Creek at Oak Ridge (7), and Miners Ravine at Dick Cook Road (1) all have average *E. coli* results above the EPA recommended guideline (320 MPN/100 mL). While there were detections at nine sites (shown in Graph 1), their occurrences were fewer relative to the sample count for Linda Creek at Oak Ridge (7), Cirby Creek at Elisa Way (12), and Dry Creek at Walerga Bridge (9). There were no detections along the Secret Ravine-Miners Ravine confluence (4, 3, 10) or Hayer Dam (13).

The sub watershed is primarily urban (Jin et al., 2013), and non-point sources are abundant. It is heavily utilized for recreational activities, and is home to numerous waterfowl throughout the year as well. In addition, the increasing drought may be a contributing factor for contamination as the waters become more concentrated. Further study is needed to identify specific sources.

Nine sites in the Dry Creek sub watershed were sampled for pathogenic *E. coli* O157:H7, *Cryptosporidium*, *Giardia*, and *Salmonella*. Five of the sites tested positive for pathogens (shown in Table 2). There are currently no water quality objectives for these constituents.

WHY THIS INFORMATION IS IMPORTANT?

In 2012, the USEPA amended recreational water quality guidelines for human health under the Clean Water Act, specifying the standard threshold value (STV) for the indicator bacteria *E. coli* as 320 colony-forming units (CFU) per 100 milliliters (mL). The STV represents the 90% percentile of the water quality distribution, beyond which the water body is not recommended for recreation (Nappier & Tracy, 2012).

E. coli is an indicator of potential fecal contamination and risk of illness for those exposed to water (e.g. when swimming). Since *E. coli* is only an <u>indicator</u> of potential pathogens and does not necessarily identify an immediate health concern, the data collected from this study provide more information on pathogen indicators as well as specific water-borne pathogen concentrations to better assess their impact on the beneficial use of recreation and to identify potential contributors by sub watershed.

WHAT FACTORS INFLUENCE THE MEASURE?

E. coli and specific water-borne pathogens can come from human or animal waste and may be highly mobile and variable in flowing streams. In addition to human recreational use, the presence of pathogens in water may be the result of cattle grazing, wildlife, urban and agricultural runoff, or sewage spills. The physical condition of the watershed may also influence pathogen measurements, however in this study field measurements (temperature, SC, DO, turbidity and pH) were variable between sites and it is unclear if these constituents had an effect on the *E. coli* or pathogen measurements.

TECHNICAL CONSIDERATIONS:

- Data available at: CEDEN
- *E. coli* is only an <u>indicator</u> of potential pathogens and does not necessarily identify an immediate health concern.
- Public reports and fact sheets are available at:
  http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_studies/surface_water_ambient_monitoring/swamp_regionwide_activities/index.shtml

California Regional Water Quality Control Board, Central Valley Region

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